

# IF PEARY'S MIGHTY METEORITE HIT NEW YORK.

MR. GARRETT P. SERVISS, THE EMINENT ASTRONOMICAL WRITER, PICTURES THE DISASTROUS EFFECT OF THIS SEVENTY-TON AERIAL MONSTER IF IT SHOULD HAPPEN TO MAKE NEW YORK ITS TARGET ON A QUIET JUNE AFTERNOON.

BY GARRETT P. SERVISS.

LIEUTENANT PEARY will sail for the North from Boston on June 20. If success attends him he will not return until he has reached the North Pole, an undertaking which, carried out according to his plan of establishing a series of stations, each more advanced than its predecessor, may require several years.

But he has other aims and objects besides the conquest of the Pole. Among these is the sending to the United States of the immense iron meteorite, which he discovered in his earlier explorations near Cape York. Last year he endeavored to get this stranded traveler from interplanetary space aboard his ship, but its weight was so great that it broke the tackle to pieces, and the attempt had, for the time, to be abandoned. This year he is confident that the meteorite will be captured; and, while he continues his journey toward the Pole, the ship will return with its curious cargo.

It has been estimated that this mass of iron, which did not originate on the earth, but fell at some unknown period from the sky, weighs about seventy tons, or 140,000 pounds. It is undoubtedly the largest meteorite yet discovered, and, as a scientific gem, it may be worth the \$50,000 which some one has mentioned as its probable value.

Iron meteorites usually contain a small percentage of nickel, but, of course, the value set upon such an object has no relation to the intrinsic worth of the materials. There can hardly be said to be a regular market for meteorites, and yet they do pass occasionally from hand to hand, or from collection to collection, by sale. A bit of meteorite as large as the tip of one's little finger sells for \$10 or \$15 or \$20, according to its excellence and interest as a specimen.

Meteorites weighing many pounds have sometimes been sold at the rate of \$8 or \$10 per pound. Some twenty years ago a great iron meteorite from Greenland, weighing about five tons, was offered for sale in New York for \$12,500.

It is an interesting fact that the largest known meteorite, next to Peary's, also came from Greenland. It weighs about eleven tons and is now in the hall of the Royal Academy at Stockholm. The museum at Copenhagen contains another giant fallen from the sky, whose weight is nine tons. Both of them were found by Nordenskiöld in 1870 on the island of Disko, off the western coast of Greenland, some 800 miles south of Cape York, where Peary made his remarkable find.

The existence of these monster iron meteorites scattered along the western side of Greenland indicates that at some time a remarkable bombardment from the heavens occurred in that part of the world.

When these celestial missiles fell upon Greenland is not known. There is no tradition which fixes the date of their descent from the sky. If it had been witnessed by human eyes it seems probable that some legend concerning the phenomenon would have survived, because the spectacle, particularly if the fall occurred at night, must have been indescribably grand, as well as fearful.

If the great mass which Lieutenant Peary hopes to send home this Summer weighs seventy tons now, it may have weighed several hundred tons when it entered the atmosphere. Explosions doubtless took place in the air along the course of the meteor, and fragments may have been scattered over a track hundreds of miles in length. It is possible that there was more than one original mass and that the meteorites found at Disko did not fall at the same time as those near Cape York.

Since no one saw these great meteors fall from the sky, how is it known that they are not masses of iron formed in the earth itself? The answer is that meteorite iron possesses a peculiar crystalline structure different from that of any form of terrestrial iron. When an iron meteorite is polished and the polished surface is etched with acid, characteristic lines and figures make their appearance, and these are never found in any other kind of iron. Inasmuch as these figures, called from their discoverer Widmanstätten figures, are always visible in iron meteors which have been seen to fall from the sky, and are never visible in ordinary iron, they constitute a test for the detection of meteors. Now, pieces cut from the great Cape York meteorite exhibit the tell-tale figures and thus establish its celestial origin.

In fact, the most interesting meteorites in existence have been identified by their structure, and no one knows when they fell upon the earth. This is true of the celebrated diamond-bearing meteorites found a few years ago near the Canon Diablo in Arizona and specimens of which are to be seen at the Yale Museum and elsewhere. These meteorites, which originally, no doubt, constituted a single mass that was broken to pieces when it struck the earth, are composed largely, but not entirely, of iron. They, therefore, differ in composition from the almost pure iron meteors of Greenland. When an attempt was made to polish a specimen of the Canon Diablo meteorites in Philadelphia, the emery wheel employed for the purpose was ruined in the operation. This led to a close examination of certain minute black dots scattered through the substance of the meteorite and then the astonishing fact was developed that these little crystalline specks were genuine diamonds.

The largest were hardly equal in magnitude to small pin heads and their color was not that of a first water stone—nevertheless they were actual specimens of the king of gems, enclosed in a mass of iron and other minerals, which had fallen from the sky!

Where were those diamonds made, and how? There is hardly anything more wonderful in the history of science than the manner in which this jeweled meteor, carelessly flung from the sky upon the earth and accidentally picked up in a stony desert, has linked itself with the chain of discovery which to-day has almost reached—perhaps quite reached—one of the greatest secrets of nature's laboratory, the making of diamonds. M. Moissan, the great French chemist, makes diamonds, very much resembling those of the Canon Diablo meteorite, by mixing carbon in a mass of molten iron, under great pressure, subjecting the mass to enormous heat in the electric furnace, and then letting it cool. When he breaks open the iron he finds minute black diamonds diffused through its substance.

Did Nature do M. Moissan's trick in some stary laboratory?

It looks that way. But that is not all. The ingenious Frenchman cannot make diamonds of more than microscopic size. Nature makes them as large as we are able to pay for. Now here we are on the verge of another step connecting meteors with diamonds. Meteorites contain besides iron more than twenty other chemical elements, but these are always combined in a peculiar manner—a manner which is only imitated on the earth by minerals ejected from volcanoes. The great diamond fields of South Africa are known to occupy the "pipes," or vents, of ancient volcanoes, which were left chock full of lava ages ago. Disseminated through this cooled volcanic mass are found the diamonds like plums in a pudding. Those ancient volcanoes of South Africa were diamond factories. In their fiery throats existed those conditions of tremendous pressure and intense heat which M. Moissan has been able to imitate on a small scale in his electric furnace. He makes diamonds as big as pin heads; Nature made them as large, sometimes, as hen's eggs, but the process was, at bottom, the same.

But Nature has shown us that her powers of production are not limited to the making of microscopic diamonds. Can it be possible, then, that somewhere on the earth, waiting for a lucky discoverer, there lies a meteorite which some star has bestowed as a gift, and which, on being burst asunder, will dazzle the eye with such a diamond blaze as no jeweller's bench in Amsterdam ever displayed?

One might hope that Lieutenant Peary's huge meteorite contained some such crystalline wonder; but for the fact that it is evidently not of the diamond-bearing variety. Indeed, meteorites containing diamonds are very rare, and the only other ones besides those of Arizona yet discovered were found some years ago in Siberia.

Returning to Peary's meteorite, the recollection of what kind of a projectile that enormous mass of iron was when it struck the shore of Greenland gives one a formidable and somewhat startling sense of the destructive power that such missiles shot out of viewless space possess.

It is indeed exceedingly fortunate that among the thousands of meteors which plunge into the atmosphere from outer space every twenty-four hours there is rarely one sufficiently massive to escape combustion before it strikes the ground. Most of those

nature, causes it to fly into fragments with a loud explosion, and the pieces reach the earth sometimes miles apart. The average velocity of a meteorite being about twenty-six miles per second, it is readily seen that the time required to reach the earth from the upper limit of the atmosphere (for what practically amounts to its upper limit) cannot be more than a few seconds, even when the meteorite falls on a long slant instead of nearly perpendicularly. The consequence is that while the surface of a large meteor is melted, and gouts and spurts of liquid iron and even clouds of iron vapor mark its track through the air,



SAYS MR. SERVISS: "Imagine an iron missile weighing seventy tons and flying with a velocity of several miles in a second to descend among the nest of towering structures in lower New York!"

which make streaks of fire in the sky at night are probably smaller than ordinary bullets, or even than birdshot, and against such missiles the atmosphere is a most admirable and perfect shield. They cannot possibly get through it, although their velocity is, on the average, forty-five or fifty times as great as that of the swiftest projectile fired from a modern cannon at the moment when it leaves the muzzle. In fact it is their extreme velocity which causes their destruction. The friction of the air, even at a height of fifty to seventy-five miles above the earth, is sufficient to develop a degree of heat amounting to thousands of degrees, so that, in a second, they are not only melted, but dissipated in vapor.

When, however, a large and solid mass like the Cape York meteorite enters the atmosphere even the tremendous heat developed in the passage to the earth is unable to destroy it. Frequently the heat, especially if the mass is of a partially stony

yet the mass as a whole is not affected, because the heat cannot so quickly penetrate it.

Meteors have actually been seen to fall in a blaze of fire whose surfaces were incandescent when they touched the ground, and which, when broken, were found to be intensely cold; so cold, in fact, that frost immediately formed upon them through condensation of the moisture in the air.

Although the velocity of a falling meteor is partially destroyed by the resistance of the air, yet in the case of such a body as that which Lieutenant Peary hopes to obtain, and which, if obtained, ought to be secured for our museum in Central Park, the battering and smashing energy remaining in it when it finally reached the ground must have been tremendous.

Imagine an iron missile weighing seventy tons and flying with a velocity of several miles in a second to descend among the nest of towering structures in lower New

York! It is as if the wall were a slice of gingerbread, and the shock to a building tightly bound together with an iron skeleton would probably bring the whole structure thundering down."

If the direction of the meteor's flight were approximately horizontal for a considerable distance it would possess energy enough to penetrate many walls, one after another. And in addition to the destruction wrought by the shattering effect of the blow would be that arising from fire. The surface of the flying iron would be aglow with the fiercest heat, and showers of white-hot metal would be scattered from it in all directions. The greater the strength of the wall it encountered the higher would be the temperature developed by the impact.

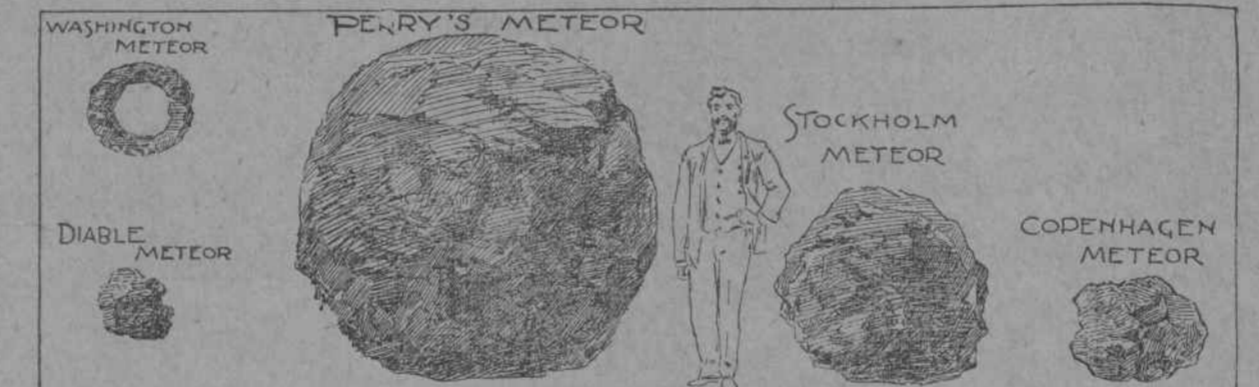
And when it struck there would be a sudden local development of heat, the degree of which would depend upon the remaining velocity of the meteor and the rigidity of the body encountered, but which might easily suffice to melt a large portion of the meteor on the spot, and also to melt the sand, or rock, which had brought it to rest.

If the great Cape York meteorite had been discovered immediately after its fall it would doubtless have been found that the soil and surface rock had been intermixed with the iron, recalling the way partially melted bullets were found embedded in shattered bones during the Franco-Prussian war. In fact, it would only be necessary

to about double the present velocity of bullets fired from high-power guns in order to turn them practically into meteors leaving wakes of fire in their flight. It has been demonstrated that a body moving at the speed of 5,000 feet per second develops so much caloric energy that the air in touch with it is virtually at the temperature of red heat.

Whenever it becomes possible to shoot projectiles two or three miles in a second it will be unnecessary to fire red-hot cannon balls in order to set fire to an enemy's works. But Lieutenant Peary's gigantic cannonball in Greenland, when it struck the airy shield of the earth, was travelling at least ten times faster yet.

GARRETT P. SERVISS.



PEARY'S 140,000 POUND METEORITE COMPARED WITH OTHER GREAT METEORITES

fact, the mere passage of such a meteor through the atmosphere would produce an astonishing gust of heat close to its course. An iron meteor of seventy tons, moving with a velocity of twenty miles per second, would develop in the process of being brought to rest a quantity of heat sufficient to impart to its entire mass a temperature of 13,000,000 degrees.

But this heat would not all be produced at once. The process would continue as long as the mass was in motion. While it was moving through the air it would heat the latter in touch with it to a temperature of thousands of degrees. In consequence of the swiftness of its own motion, and the rapid transformation of that motion into heat, the flying meteor would move continually amid a furnace blast of its own creation.

Striking the side of a towering wall on a slanting course toward the ground it would penetrate it as if the wall were a slice of gingerbread, and the shock to a building tightly bound together with an iron skeleton would probably bring the whole structure thundering down.

It has now been discovered that the moon has undergone a bombardment compared to which the efforts of our biggest modern guns would pale into insignificance. Projectiles weighing thousands of tons, with a velocity greater than that of any modern rifle bullet, have been hurled at the satellite, shattering themselves on its surface or imbedding themselves in its soil.

Hit by a mass of iron bigger than all the guns of the United States Navy rolled together, the moon has staggered under the blow, but, refusing to be smashed, has "come up smiling" like a prize fighter in the ring.

The moon, however, shows the effects of this terrific bombardment. Its face is smeared and battered like that of a pugilist who has doggedly fought down his antagonist.

These amazing discoveries are based upon the observations which have recently been made by Prof. G. K. Gilbert, of the United States Geological Survey. They tend to show that the moon at one time was a huge ball of mud or other plastic substance; that it did not come straight from the fiery furnace of creation as a complete moon, but that it has absorbed other moons and is an aggregation of a lot of moons, meteors and comets which were at one time floating around loose in the sky.

More amazing than this is the statement that the earth at one time had to get along without any moon at all, and that, instead, it was surrounded by a ring like that of Saturn. Saturn, with the enormous ring which surrounds it, is one of the most sensational spectacles in the sky. It is unlike any other planet.

The huge ring of Saturn can be very easily distinguished, and for ages it has puzzled astronomers. The first theory about this ring was that it was made of gas. That idea has now been exploded.

At the same time it has been ascertained that the ring of Saturn is not solid, because on certain occasions stars have been seen through it. The only reasonable inference is that it is composed of bodies similar to the meteors which are continually falling to the earth.

Saturn, then, is surrounded by a ring of meteoric particles, so to speak, which move in obedience to the laws of gravitation and centrifugal force. In the course of time these particles will come together by mutual attraction and form bodies of larger size.

In turn, these bodies will combine, and eventually Saturn, instead of having a ring, will be surrounded by a flock of little moons, as we should call them. Later on

## BOMBARDMENT OF THE MOON BY MOONLETS.

By Expert Gilbert of the Geological Survey.

We may regard the ring of Saturn as representing the first step in the evolution of a moon. The next step, through aggregation of the particles composing the ring, would be a number of moonlets, which, being attracted toward each other, would have a tendency to join together, forming a single large moon. In this way we may imagine that the moons of all the planets which possess satellites were formed.

G. K. GILBERT,  
United States Geological Survey.

The little moons will make big moons, and finally the whole ring of to-day may become a single big satellite travelling in a regular orbit about the giant planet.

And just here comes in a very interesting theory of Professor Gilbert, who is one of the most distinguished men living in his line of research. He believes that the peculiar, scarred condition of the moon's surface is due to the impact of moonlets which fell upon that satellite, when the latter was in a comparatively plastic condition.

The map of the moon shows a number of great plains with dark floors; also, a score of mountain chains and a few trough-like valleys remarkable for their straightness. There are likewise several thousand circular bowl-shaped cavities, which most observers have taken to be craters of extinct volcanoes.

These craters have usually a circular rim of cliffs, which rise to a height of 5,000 to 10,000 feet. There are from 20,000 to 30,000 such craters visible to the eye with the aid of a first-rate telescope.

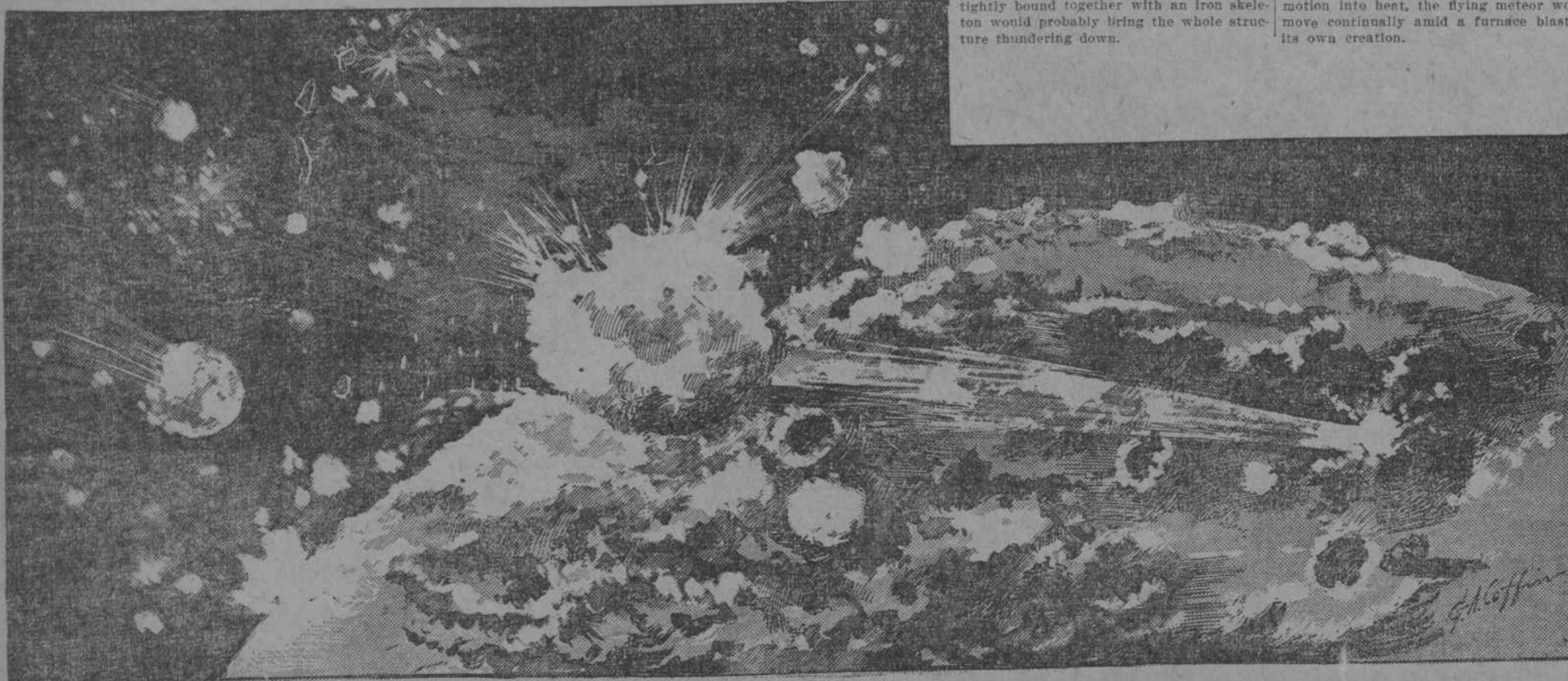
One of the great plains on the moon's surface is called the Mare Imbrium. The hills and furrows in its neighborhood are all softened to the eye in such a manner as to make the surrounding landscape look as though it had been overspread with a layer of semi-liquid matter.

This is believed by Professor Gilbert to have been the case. Once on a time the moon at this spot is imagined to have been struck by a moonlet eighty or one hundred miles in diameter.

The result was the generation of an enormous heat, which melted the greater part of the gigantic projectile instantaneously. Thus a deluge of semi-liquid material was poured over the surface of the lunar satellite, reaching for hundreds of miles in all directions.

The small craters it obliterated, while it partly filled up some of the larger ones. At the same time, solid fragments of the moonlet were scattered about, some of them flying 1,000 miles through the air and then scorching out furrows from the moon's surface as wide and deep as the Grand Canon of the Colorado.

One of the furrows dug by such a fragment is 187 miles long and from 10 to 25 miles broad, with a depth of 11,000 feet. In order to understand the force of this theory one should study the ground, so to speak, through a telescope; then the strength of the reasoning will be apparent. The biggest "craters" on the moon range from 8,000 to 15,000 feet in depth. The volcanic craters on the earth do not exceed 4,000 feet in depth.



Moonlets Hurling Themselves at the Moon—The New Scientific Theory to Explain the Moon's Curious Surface.